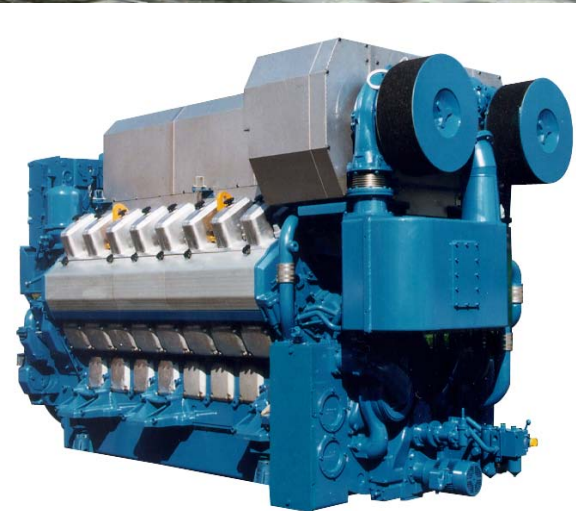
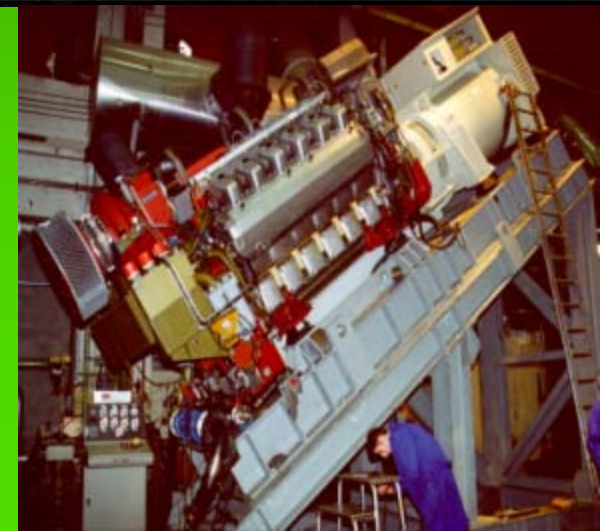


# The Future Fleet - Type 45 Project



## Main technical data

- Bore 200 mm
- Stroke 240 mm
- Swept volume 7,5 liter./cyl
- Speed 1200 - 1500 rpm
- Weight 13000 - 19000 kg





# Potential Future Fleet (CVF, FSC) - Trimaran Frigate



Slide serial no 12  
ME213/2 - DDO





## ME Development Strategy Paper

**Advanced Cycle  
Gas Turbines**

**Integrated Full  
Electric Propulsion**

**Widespread  
Electrification**

**Diesel Beater?**

**Investment Appraisal**

**COTS?**

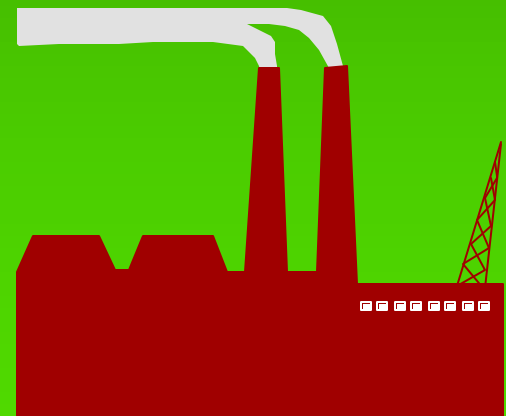
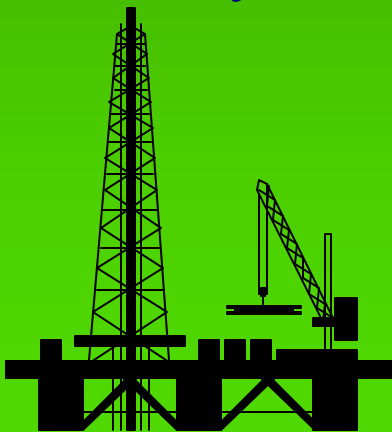
# Emissions

- Background
- Policy / Strategy
- Monitor
  - ◆ Legislation
  - ◆ Technology
- Evaluate
- Development
  - ◆ SCR
  - ◆ NTP



# Background

“ We as a species, as a planet,  
are teetering on the edge,  
living unsustainably and perpetuating  
inequity,  
and may soon pass the point of no return.”





# MOD - Policy/Strategy

- the MOD **must** comply with UK legislation
- the MOD **must** comply with international conventions to which the UK is a signatory
- the MOD **cannot** invoke Crown immunity unless operationally necessary
- regulations of host nations **must** be respected
- the MOD is to take a **lead** in addressing environmental issues and to enhance the natural environment
- the specific RN policy on engine emissions is derived from general MOD policy

# Survey on Measures to Reduce the NO<sub>x</sub> Emissions

## MEASURES

### Engine internal (Primary)

#### Modifications of the combustion process

Retarded injection

Injection rate modelling

Miller supercharging

#### Exhaust gas treatment in the combustion chamber

Fuel-water emulsion

Direct water injection

Humidification of intake air

### Engine external (Secondary)

#### Exhaust gas treatment outside the combustion chamber

Catalytic Subsequent Exhaust gas treatment  
SCR

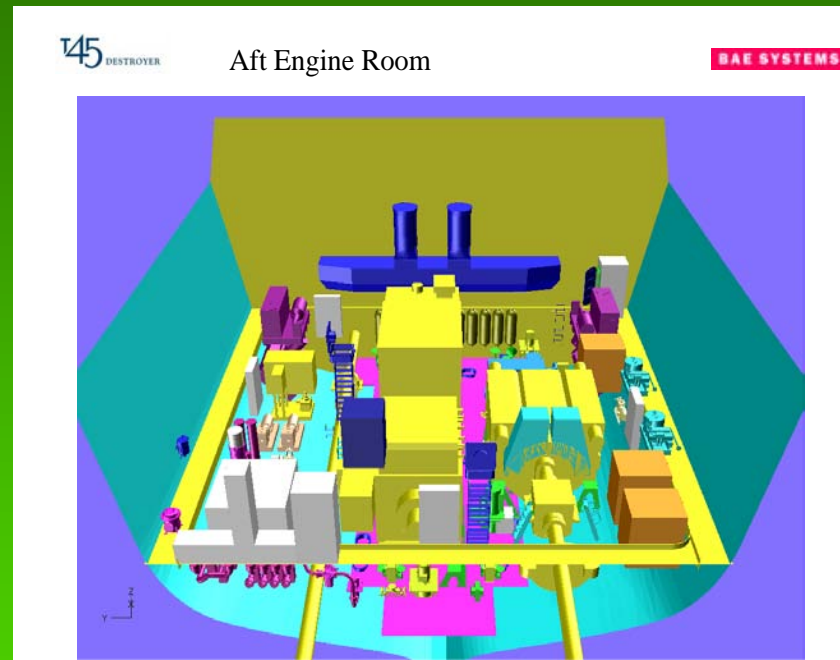
Non-Thermal Plasma  
AEA Technology

# Environmental Aim - UK MOD(N)

*To maintain legislative compliance*

## ● DEVELOPMENT

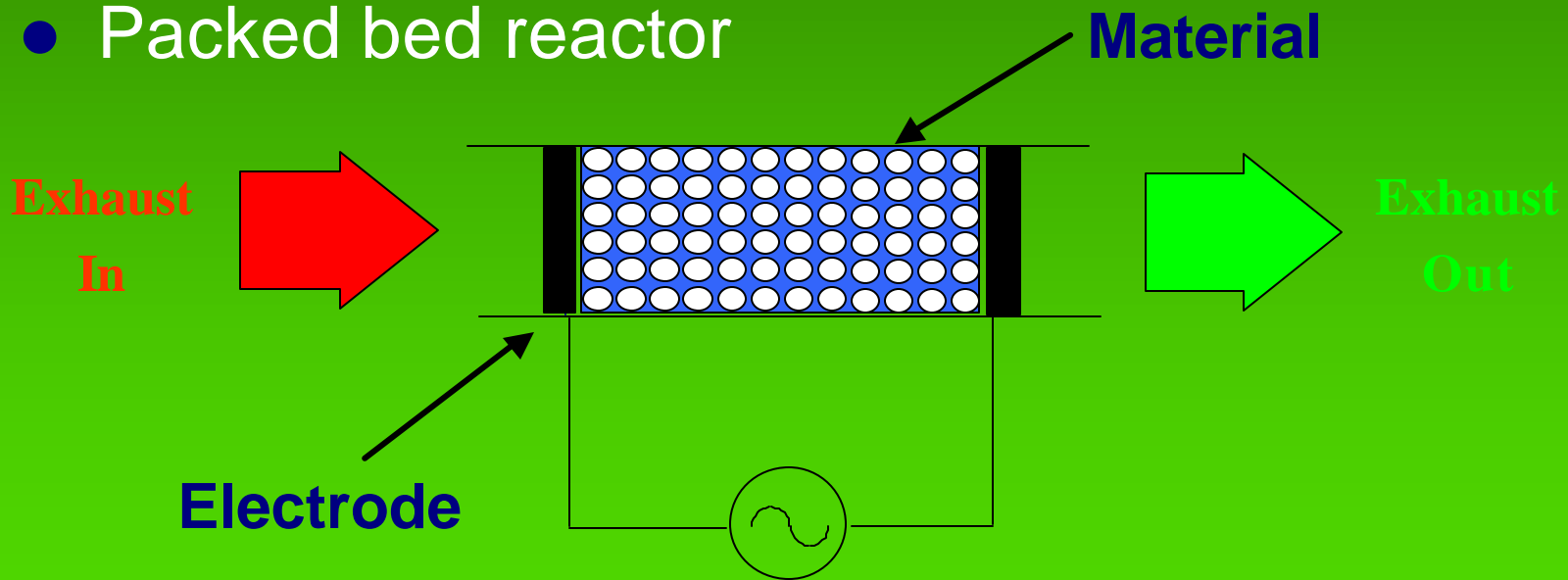
- ◆ Aftertreatment as good as SCR
- ◆ improved performance
  - ◆ low load
  - ◆ shock
  - ◆ nil reductant requirement
  - ◆ fullest range of engine sizes
  - ◆ all environments
  - ◆ (including submarines)
  - ◆ all MGO fuels





# NTP - Principle of Operation

- Surface discharge
- Electrically augmented catalyst
- Alternating high voltage
- Packed bed reactor





# 1/10th scale system design

## *Combined NOx and particulate removal*

- Encapsulating full scale design features
- Ship Integration
  - Type 23 Frigate
  - HUNT, SRMH, LPH, ASTUTE, FASM, FSC, CV(F)
  - ILS / ARM
- Safety Case
  - DEFSTAN 00-56, JSP 430, JSP 375 & JSP 418
- To be tested on indicative engine
  - Paxman Valenta/ VP185